## REMARKS

In the Action, claims 1-3, 5, 6 and 8-15 are rejected. In response, claim 1 is amended to include the subject matter of claims 8 and 9, which depended directly or indirectly from claim 1. Since independent claim 1 is amended to include the subject matter of the dependent claims, this amendment does not raise new issues after the final rejection. Claims 8 and 9 are cancelled from this application.

In view of these amendments and the following comments, reconsideration and allowance are requested.

**Rejection Under 35 U.S.C. § 103(a)**

Claims 1-3, 5, 6 and 8-13 are rejected under 35 U.S.C. § 103(a) as being obvious over U.S. Patent No. 3,709,928 to Murayama et al. in view of U.S. Patent No. 4,317,926 to Sato et al., and further in view of the passage from the *Kirk-Othmer Encyclopedia of Chemical Technology* relating generally to (meth)acrylic acid. Murayama et al. is cited for disclosing a process for producing hydroxyalkyl acrylates and hydroxyalkyl (meth)acrylates and distilling the reaction product to purify the resulting hydroxyalkyl acrylates and hydroxyalkyl (meth)acrylates. Sato et al. is cited for disclosing the use of polymerization inhibitors, and *Kirk-Othmer* is cited for disclosing that (meth)acrylic acid is an industrially important chemical. The rejection is based on the position that it would have been obvious to recover (meth)acrylic acid by distillation and to recycle the recovered (meth)acrylic acid to the reaction mixture because it is a valuable reactant.

As amended, claim 1 is directed to a production process for producing hydroxyalkyl (meth)acrylates including the steps of reacting (meth)acrylic acid and an alkylene oxide to produce a reaction liquid containing unreacted (meth)acrylic acid and unreacted alkylene

oxide and crude hydroxyalkyl (meth)acrylate, distilling the reaction liquid in a first distillation step under a specified operational pressure, recovering and recycling the distillate containing the unreacted (meth)acrylic acid with a concentration of the (meth)acrylic acid in the reaction liquid in the range of 0.1 to 20 wt% and distilling the reaction liquid containing the crude hydroxyalkyl (meth)acrylate in a second distillation step to purify the hydroxyalkyl (meth)acrylate. As amended, claim 1recites the invention as having two distillation steps. The first distillation step recovers the (meth)acrylic acid for recycling to the reaction liquid and the second distillation step for removing impurities and purifying the resulting hydroxyalkyl (meth)acrylate. These features are not disclosed or suggested in the art of record.

Murayama et al., either alone or in combination with the secondary references, do not disclose or suggest the claimed invention as recited in amended claim 1. Murayama et al. is relevant to the extent that a process is disclosed for purifying hydroxyalkyl (meth)acrylates by distillation. There is no suggestion of carrying out a first distillation step to recover (meth)acrylic acid and recycling the recovered (meth)acrylic acid, and a second distillation step to purify the resulting hydroxyalkyl (meth)acrylate. Murayama et al. discloses a process for producing hydroxyalkyl (meth)acrylates by reaction of alkylene oxides and (meth)acrylic. As recognized in the Action, Murayama et al. only discloses distilling the resulting reaction mixture to recover a purified hydroxyalkyl (meth)acrylate.

The Action contends that the claimed invention is *prima facie* obvious because the distillation is within the level of skill of one of ordinary skill in the art. Where the art of record provides no suggestion of the claimed step, obviousness is not established simply because one skilled in the art is capable of carrying out the claimed step. The rejection is based on hindsight and a conclusion that is not supported by the art of record. It is well

established that obviousness requires some suggestion, motivation or incentive to modify the primary reference in the manner suggested in the Action.

The rejection cites the passage from the *Kirk-Othmer Encyclopedia of Chemical Technology* to support the position that (meth)acrylic acid is a "valuable" component. The Action asserts that recycling of "valuable materials" is obvious in view of the references that "teach its value" such as *Kirk-Othmer*. This position is not supported by the art of record and is based solely on hindsight. Applicants recognize that (meth)acrylic acid is a commonly used reactant and monomer component in the industry. However, simply because a compound is a known reactant does not provide the necessary incentive or motivation to modify the primary patent and does not establish *prima facie* obviousness. Clearly, the passage in *Kirk-Othmer* provides no suggestion of distilling a reaction product to recover (meth)acrylic acid. Furthermore, the passage in *Kirk-Othmer* provides no suggestion of recycling (meth)acrylic acid that is recovered by distillation from a reaction product. Accordingly, *Kirk-Othmer* does not provide the necessary motivation or incentive to modify Murayama et al. as suggested in the Action.

The Action refers to Table 1 of Murayama et al. as disclosing the distillation of a reaction product containing (meth)acrylic acid. Murayama et al., and particularly Table 1 of Murayama et al., are relevant only to the extent that Murayama et al. discloses that small amounts of unreacted (meth)acrylic acid remain in the reaction product. There is clearly no suggestion in Murayama et al. of distilling the reaction product to recover the (meth)acrylic acid.

In particular, Example 2 of Murayama et al., which forms the basis of Table 1, discloses that the reaction product (before distillation) of the crude hydroxyalkyl (meth)acrylate contains 0.4 wt% unreacted (meth)acrylic acid. See, for example, column 5,

lines 64-66. The resulting reaction product containing the crude hydroxyalkyl (meth)acrylate in Example 2 is then mixed with triethylene glycol and subjected to a simple distillation to obtain 624 g of the product. The product after distillation still contains 0.4 wt% of (meth)acrylic acid. See, column 5, lines 68-74 of Murayama et al. Thus, Example 2 of Murayama et al. specifically discloses that the reaction product contains 0.4 wt% unreacted (meth)acrylic acid before distillation and 0.4 wt% (meth)acrylic acid after distillation. Thus, it is clear that Murayama et al. does not recover unreacted (meth)acrylic acid from the reaction product. Furthermore, Murayama et al. provides no teaching or suggestion to one of ordinary skill in the art that unreacted (meth)acrylic acid can be recovered by distillation from the reaction product. Accordingly, it would not have been obvious to one of ordinary skill in the art to recycle a reactant such as (meth)acrylic acid that has not been separated from the reaction product.

Murayama et al. does not teach or suggest the recovery of the unreacted (meth)acrylic acid from the hydroxyalkyl (meth)acrylate, and thus, provides no suggestion of recycling unreacted (meth)acrylic acid. Even if (meth)acrylic acid is known to be a valuable component, it would not have been obvious to one of ordinary skill in the art to recycle (meth)acrylic acid from the reaction product since Murayama et al. does not separate the unreacted (meth)acrylic acid from the reaction product and does not recycle unreacted components.

Table 1 of Murayama et al. is provided to show the effects of the addition of the glycol to the distillation, and particularly to the reduced amount of ethylene dimethacrylate and the solids adhering to the still. As specifically disclosed in column 5, lines 33-36 of Murayama et al., the addition of the polyalkylene glycols results in a commercially viable purification process. Murayama et al. is only concerned with purifying the resulting

hydroxyalkyl (meth)acrylate and minimizing the amount of impurities and byproducts in the recovered reactant. The distillation step of Murayama et al. is designed to maximize the amount of hydroxyalkyl (meth)acrylate while minimizing the amount of impurities and byproducts, and particularly minimizing the amount of ethylene dimethacrylate.

Column 2, lines 25-49 of Murayama et al. disclose that the insoluble solids adhere to the distillation apparatus which require an increase in the heat to enable distillation of the hydroxyalkyl (meth)acrylates. The increase in the heating causes the formation of the diesters to distill along with the hydroxyalkyl (meth)acrylates. Murayama et al. is specifically directed to reducing the formation of the diesters, thereby improving the yield of the hydroxyalkyl (meth)acrylates during the purification and distillation step. Murayama et al. is clearly not concerned with recovering and recycling (meth)acrylic acid from the resulting reaction mixture. The motivation or incentive to modify Murayama et al. in the manner suggested in the Action to recover and recycle (meth)acrylic acid is not established simply by referring to reference material disclosing that (meth)acrylic acid is a known reactant. The passages referred to in Murayama et al. and the general disclosure of (meth)acrylic acid in the *Kirk-Othmer* literature does not establish *prima facie* obviousness.

The invention as recited in amended claim 1 recites a first distillation step to recover unreacted (meth)acrylic acid which is then recycled, and a second distillation step to purify the resulting hydroxyalkyl (meth)acrylic by a purification step. In view of the deficiencies of Murayama et al., it would not have been obvious to one of ordinary skill in the art to carry out two distillation steps and recover and recycle unreacted (meth)acrylic acid from the first distillation step as claimed. Murayama et al. either alone or in combination with Sato et al. and *Kirk-Othmer* provide no suggestion of recovering (meth)acrylic acid by distillation and

recycling recovered (meth)acrylic acid, followed by a purification step by a second distillation process. Accordingly, claim 1 is not obvious over the art of record.

The claims depending from claim 1 are also allowable for reciting additional features of the invention that are not disclosed or suggested in the art of record. Murayama et al. and the secondary references do not suggest recovering unreacted alkylene oxide with the unreacted (meth)acrylic acid as in claim 2, separating unreacted alkylene oxide from the reaction liquid in a first step, and thereafter recovering unreacted (meth)acrylic acid by the distillation as in claim 3, either alone or in combination with the process of claim 1. Murayama et al. further fails to suggest the distillation plate column of claim 5 or distilling in the presence of polymerization inhibitors as in claim 6. Sato et al. is cited for disclosing the conventional use of polymerization inhibitors. However, Sato et al. does not suggest distilling a reaction product containing hydroxyalkyl (meth)acrylates to recover unreacted (meth)acrylic acid. Accordingly, claims 5 and 6 are not obvious over the art of record.

The art of record further fails to disclose or suggest continuously recycling unreacted (meth)acrylic acid as in claim 10, transferring the distillate to a reaction apparatus as in claims 11, 12 and 13, storing the distillate in an intermediate tank as in claim 14, or lowering the amount of the hydroxyalkyl (meth)acrylate as in claim 15. Accordingly, these claims are also not obvious over the art of record. As disclosed on pages 13 and 14 of the specification, the features of storing the distillate and lowering the concentration of the hydroxyalkyl (meth)acrylate in the distillate are advantageous to the process. The plate column and/or packed column are used to decrease the amount of the distillate and the concentration of the hydroxyalkyl (meth)acrylate. The reaction yield is decreased only a small amount when the distillate is recycled in the reaction. The reaction rate is decreased which decreases the formation of the diester or dialkylene glycol mono(meth)acrylate.

In view of these amendments and the above comments, the claims are submitted to be allowable over the art of record. Accordingly, reconsideration and allowance are requested.

Respectfully submitted,

Garrett V. Davis
Reg. No. 32,023

Roylance, Abrams, Berdo & Goodman, L.L.P.
1300 19th Street, N.W., Suite 600
Washington, D.C. 20036-1649
(202) 659-9076

Dated: Oct 2, 2006